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(54) Name of the invention: Manufacturing Method for the Preparation of Cell Barrier for Plasma Display Panel

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*[ Note : Names, addresses, Company names and brand names are translated in the most common manner. Japanese Language does not have singular or plural words unless otherwise specified with numeral prefix or general form of plurality suffix. Translator's note.]*

**(54) [Name of the invention]**

**Manufacturing Method for the Preparation of Cell Barrier for Plasma Display Panel**

**(57) [Summary] [There is an amendment]**

**[Goal]**

The goal of the present invention is to manufacture simply, expediently and stably and with a good precision a cell barrier with any type of shape.

**[Structure]**

The technological process involves the procedure where in the intaglio part of the roll intaglio that has a printing surface corresponding to the shape of the cell barrier part 1, a ionization radiation curable resin material is filled and together with that the film substrate material 21 is contacted to the roll intaglio, and as these are in contact, by using irradiation by ionization radiation, the ionization radiation curable resin material is cured (hardened) and by that the ionization radiation curable resin layer 22 was formed, and after that the ionization radiation curable resin layer was separated from the film substrate and together with that from the roll intaglio, and the sheet 2 was obtained, that has the sheet indented part 23, with a shape that has protrusions and indentations that are opposite to those of the cell barrier part. In the indented part of the sheet, the glass paste 8 was filled. The molding sheet was adhered to the glass substrate plate, and after that, it was separated, and the glass paste was transferred onto the glass substrate plate. And then the transferred glass paste is annealed.

**[Range of the claims of the invention]**

**[Claim 1]**

Manufacturing process for the preparation of a cell barrier for plasma display panel, characterized by the fact that it is a manufacturing process for the preparation of a cell barrier for plasma display panel, that is formed as the front surface plate and the back surface plate, that is equipped with a cell barrier which has a structure formed from a number of vacant spaces used for electrical discharge, are positioned so that they are oriented in mutually parallel directions, and it consists of the following here below (A) ~ (D) technological processes.

(A) Molding sheet manufacturing technological process where an intaglio roll is used that has an intaglio part that corresponds to the shape of the cell barrier part, and in at least the intaglio part of the roll intaglio, ionization radiation curable resin material is filled and together with that the film substrate material is contacted to the roll intaglio, and as these are in contact, by using irradiation by ionization radiation, the ionization radiation curable resin material that is present in the space between the film substrate material and the roll intaglio, is cured, and by that the ionization radiation curable resin layer was formed, and after that the ionization radiation curable resin layer that is fixed and adhered onto the film substrate was separated from the roll intaglio together with the film substrate material, and the sheet was obtained, that has the sheet indented part with a shape that has protrusions and indentations that are opposite to those of the cell barrier part.

(B) Filling technological process where in the indented part of the molding sheet, the glass paste was filled.

(C) Transfer technological process where the molding sheet that has been filled with the glass paste was adhered onto a glass substrate plate, and after that, the molding sheet was separated, and the glass paste was transferred onto the surface of the glass substrate plate.

(D) Annealing technological process where the transferred glass paste is annealed.

#### **[Detailed explanation of the invention]**

[0001]

#### **[Technological sphere of application]**

The present invention is an invention about the manufacturing method for the preparation of a cell barrier of plasma display panel (here below called PDP), that is formed as it is equipped with a number of empty spaces for electrical discharge that are formed by this cell barrier.

[0002]

### **[Previous technology]**

In the past, as the manufacturing method for the preparation of PDP cell barrier, the method has been successfully used where on a glass substrate plate, a glass paste is patterned by using a screen printing method. However, in order to obtain the height that is necessary for the cell barrier, the printing and drying has been repeated, for example, several tens of times, and by that a laminated layer has been obtained, and that is how it has been conducted. Also, in order to increase the precision of this barrier shape, the method has been also suggested where on the glass substrate plate, on the part where the cell barrier is to be provided, a lipophilic type macromolecular layer, is provided (Japanese Patent Application Laid Open Number Hei-Sei 5-166460), etc.

[0003]

### **[Problems solved by the present invention]**

However, in the case of the manufacturing methods according to the previous technology, the manufacturing equipment is not special and the technological processes are easy, however, on the other hand, there are the problems that there is the point that the number of the technological processes is large, and also, there is the trend that prior to the annealing the obtained by the screen printing cell barrier shape is destroyed, and not only that, but also, together with the increase of the number of the repeats of the screening process, the shape precision is deteriorated, and there is a deterioration of the precision, etc. As a result from that, it has been said that obtaining a high resolution image, which is a property of the display panel, is difficult.

[0004]

Then, in the case of the present invention, it is an invention that has as a goal to resolve such problems according to the previous technology, as those described here above, and then it has as a goal to suggest a new manufacturing method where a good precision cell barrier, is obtained by a simple, and fast and also stable manufacturing.

[0005]

### **[Measures in order to solve the problems]**

In order to achieve the above described goals, the manufacturing method for the preparation of a cell barrier of plasma display panel, according to the present invention, is characterized by the fact that it is a manufacturing process for the preparation of a cell barrier for plasma display panel, that is formed as the front

surface plate and the back surface plate, that is equipped with a cell barrier which has a structure formed from a number of vacant spaces used for electrical discharge, are positioned so that they are oriented in mutually parallel directions, and it consists of the following here below (A) ~ (D) technological processes.

(A) Molding sheet manufacturing technological process where an intaglio roll is used that has an intaglio part that corresponds to the shape of the cell barrier part, and in at least the intaglio part of the roll intaglio, ionization radiation curable resin material is filled and together with that the film substrate material is contacted to the roll intaglio, and as these are in contact, by using irradiation by ionization radiation, the ionization radiation curable resin material that is present in the space between the film substrate material and the roll intaglio, is cured, and by that the ionization radiation curable resin layer was formed, and after that the ionization radiation curable resin layer that is fixed and adhered onto the film substrate was separated from the roll intaglio together with the film substrate material, and the sheet was obtained, that has the sheet indented part with a shape that has protrusions and indentations that are opposite to those of the cell barrier part.

(B) Filling technological process where in the indented part of the molding sheet, the glass paste was filled.

(C) Transfer technological process where the molding sheet that has been filled with the glass paste was adhered onto a glass substrate plate, and after that, the molding sheet was separated, and the glass paste was transferred onto the surface of the glass substrate plate.

(D) Annealing technological process where the transferred glass paste is annealed.

[0006]

Here below, the manufacturing method for the preparation of a cell barrier of plasma display panel, according to the present invention, will be explained as the figures that provide the illustration are being elucidated.

[0007]

Regarding the manufacturing method according to the present invention, first in the beginning, the molding sheet, that has a shape with protrusions and indentations opposite to those of the shape of the PDP cell barrier, is manufactured. Regarding the molding sheet, it is a die where on a film substrate material, there is a layer of ionization radiation curable resin material, that forms the indented parts of the sheet, and this indented part of the sheet has a shape that is opposite to the shape of the PDP cell barrier cell shape.

[0008]

Figure 3 represents a summary diagram that shows one example of the manufacturing equipment for the preparation of such molding sheet. Regarding the roll intaglio 4, it contains the intaglio part 41, that is shaped in correspondence to the cell barrier part, that is formed from a large number of cell barriers, and it is rotating in the direction of the arrow. Then, the film substrate material 21 is pressure contacted onto the roll intaglio, by the pressing pressure roll 51, that is supplied by the appropriate translational means, and in the state as it is in contact with the roll intaglio, these are transported simultaneously and by the separation roll 52, it is separated from the roll intaglio and transported. Moreover, the adjustment of the clearance between the roll intaglio and the compressing pressure roll or the separation (or stripping) roll, etc., have become possible.

[0009]

Relative to such an intaglio roll 4 and film substrate material 21, the ionization radiation curable resin material 3 is supplied by appropriate measures in order to fill at least into the intaglio part 41 of the intaglio roll. In the same figure, the ionization radiation curable resin material is directly supplied to the roll intaglio from the bottom direction, through the coating equipment 6. Then, the film substrate material is made to come in contact with the roll intaglio and by that, the ionization radiation curable resin material, that is on the film substrate material and on the roll intaglio, is enclosed between the film substrate material and the roll intaglio, and in that state, it is irradiated by an ionization radiation beam that is irradiated from the film substrate material side, through an ionization radiation beam radiating equipment 7, and the ionization radiation curable resin material that is present in the space between the film substrate material and the roll intaglio, is cured. Regarding the ionization radiation curable resin material, by its curing, it forms the ionization radiation curable resin layer 22, in a state where it is fixed and adhered onto the film substrate material. After that, if by the separation roll, the film substrate material is separated from the roll intaglio, the ionization radiation curable resin layer is also separated together with the film substrate material, and the ionization radiation curable resin material layer forms the shape of the parts outside of the cell barrier part (the electrical discharge space), and the sheet indented part 23, that is formed from the ionization radiation curable resin material layer, forms the shape of the cell barrier part, and by that the molding sheet 2, is obtained.

[0010]

Then, a good explanation will be provided of the target cell barrier shape, the sheet indented part of the molding sheet and the shape of the intaglio part of the intaglio roll. According to Figure 2 (a), the roll intaglio 4 and its intaglio part 41 are shown, in (b), the molding sheet 2, that is obtained from the roll intaglio according to (a) and its sheet indented part 23, are shown, and in (c), the cell barrier 1, that is obtained

from the molding sheet according to (b), is shown. Then, this roll intaglio has an intaglio part that corresponds to the shape of the cell barrier part. Namely, if the intaglio part 41 of the roll intaglio 4, is made to be an indented empty space, that is intuitively an indented part, the intaglio part has the same shape as the part that is outside of the cell barrier part (the discharge space). In other words, conversely, the part that is outside of the intaglio part (the protruded part) has the same shape as the shape of the cell barrier part. On the other hand, in the molding sheet 2, the indented part space of the sheet indented part 23, becomes the same as the shape of the cell barrier part. Moreover, even though it is possible that from a flat intaglio a molding sheet is produced from a number of leafs, for the sake of simplicity of the explanation, according to Figure 2 (a), the printing surface of the roll intaglio, is made to be a flat surface.

[0011]

As the above described film substrate material 2, it is a good option if a film is used that has flexibility properties and that has ionization radiation beam permeability properties. For example, it is possible to use films that are formed from polyethylene terephthalate, polyethylene naphthalate, etc., polyesters, polyethylene, polypropylene, polyvinyl chloride, polyvinylidene chloride, polycarbonate, polyamide, polyimide, polystyrene, ethylene - ethylene acetate, copolymer material, polyvinyl alcohol, etc., resins. Among those, in the case when the processing feasibility properties, the strength, the cost, etc., are considered, especially, polyethylene terephthalate film is a good option.

[0012]

Moreover, regarding the supply and filling of the ionization radiation curable resin material, as it is shown according to the presented in Figure 3, it can be conducted as it is directly supplied onto the roll intaglio, by using a roll coating method, or besides that, it is also a good option if it is directly supplied onto the roll intaglio through a T die etc., dies, or if prior to the contact of the film substrate material to the roll intaglio, it is coated and formed in advance on the surface of this film substrate material, by using a roll coating method etc., and these are supplied at the same time.

[0013]

Also, as the used according to the present invention, ionization radiation curable resin material, polymers, prepolymers, or monomers, that undergo a crosslinking polymerization reaction and are solidified, by the effect of an ionization radiation, can be used. In more details, radical polymerization type, as (meth)acrylamide, (meth)acrylonitrile, (meth)acrylic acid, (meth)acrylic acid ester, etc., (meth)acryloyl radical containing compounds (here, (meth)acryloyl has the meaning of acryloyl or methacryloyl. And here below, it has the same meaning.), epoxy, cationic

polymeric type that are formed from the combination of cyclic ethers, cyclic acetal, lactone, vinyl monomer, cyclic siloxane and aryl diazonium salts, diaryl iodonium salts, thiol radical containing compounds, for example, polyen / thiol type compounds formed from trimethylol propane trithioglycolate, trimethylol propane trithiopropionat , pentaerithritol tetrathioglycolate and polyen compounds.

[0014]

As a monofunctional monomer of the radical polymerization type (meth)acrylate compounds, for example, there are the following: methyl (meth)acrylate, ethyl (meth)acrylate, butyl (meth)acrylate, methoxy ethyl (meth)acrylate, methoxy butyl (meth)acrylate, butoxy ethyl (meth)acrylate, 2-ethyl hexyl (meth)acrylate, N, N - dimethyl aminomethyl (meth)acrylate, N, N- dimethylaminoethyl (meth)acrylate, N, N - diethyl aminoethyl (meth)acrylate, N, N - diethyl amino propyl (meth)acrylate, N, N - dibenzyl amino ethyl (meth)acrylate, lauryl (meth)acrylate, isobornyl (meth)acrylate, ethyl carbitol (meth)acrylate, phenoxy ethyl (meth)acrylate, phenoxy polyethylene glycol (meth)acrylate, tetrahydroxy furfuryl (meth)acrylate, methoxy tripropylene glycol (meth)acrylate, 2- (meth)acryloyl oxy ethyl - 2- hydroxy propyl phthalate, 2 - (meth) acryloyl oxy propyl hydrogen phthalate, etc.

[0015]

Also, as the radical polymerization type polyfunctional monomers, for example, it is possible to use the following: ethylene glycol di (meth)acrylate, diethylene glycol di (meth)acrylate, triethylene glycol di (meth)acrylate, propylene glycol di (meth)acrylate, dipropylene glycol di (meth)acrylate, neopentyl glycol di (meth)acrylate, 1, 6- hexyl diol di (meth)acrylate, 1, 9- nonane diol di (meth)acrylate, tetraethylene glycol di (meth)acrylate, tripropylene glycol di (meth)acrylate, bis phenol A - di (meth)acrylate, trimethylol propane tri (meth)acrylate, trimethylol propane ethylene oxide tri (meth)acrylate, pentaerithritol tri (meth)acrylate, pentaerithritol tetra (meth)acrylate, dipentaerithritol penta (meth)acrylate, dipentaerithritol hexa (meth)acrylate, glycerine polyethylene oxide tri (meth)acrylate, tris (meth)acryloyl oxy ethyl phosphate etc.

[0016]

Also, as the radical polymerization type prepolymers, for example, it is possible to use the following: alkyd (meth)acrylate, urethane (meth)acrylate, epoxy (meth)acrylate, polyester (meth)acrylate, polybutadiene (meth)acrylate, etc., (meth)acrylate type, unsaturated polyesters etc.

[0017]

Among these compounds containing (meth)acryloyl radical, especially, for the acryloyl radical containing compounds, namely, for the acrylates, the



polymerization reaction is faster. And because of that, in the case when the coating and forming of the ionization radiation curable resin material layer, is seriously considered, the speed of manufacturing, the acrylates are preferred over the methacrylates.

[0018]

Then, as the radical polymerization type ionization radiation curable resin material, the above described compounds, can be used as a mixture of two or more compounds, depending on the requirements.

[0019]

Then, here, in the case of the ultra-violet curing, as the light polymerization initiating agent, benzoin, benzoin methyl ether, acetophenone, benzophenone, Michler's ketone, biphenyl sulfide, dibenzyl disulfide, diethyl oxide, triphenyl diimidazole, isopropyl - N, N - dimethyl aminobenzoate, etc., can be used, and these can be used individually or as mixtures of two or more types, and they can be mixed in amounts that are in the range of 0.1 ~ 10 weight parts relative to 100 weight parts of the above described ionization radiation curable resin material.

[0020]

Then, here, in the composition material that contains the above described ionization radiation curable resin material, as a solvent agent that is used to dissolve the above described ionization radiation curable resin material, and to adjust its viscosity etc., to maintain and support its coatability properties, it is possible to use ethyl acetate, propyl acetate, celosolf acetate, etc., ester type, acetone, methyl ethyl ketone, ethyl isobutyl ketone, etc., ketone types, methyl alcohol, ethyl alcohol, isopropyl alcohol, etc., alcohol type, etc., solvents, where it is possible to use these individually as one type of solvent, or it is possible to mix them freely and use two or more types of solvents.

[0021]

As the ionization radiation beam, it is possible to use visible light beam, ultraviolet beam, X rays, electron beam, etc., electromagnetic waves or particulate beams. From a practical point of view, the mainly used radiation are the ultraviolet radiation and the electron beam radiation. As the ultraviolet radiation source, it is possible to use high pressure mercury lamp, ultra-high pressure mercury lamp, low pressure mercury lamp, carbon arc, black light, metal halide lamp, etc., light sources.

[0022]

As the source of the electron beam radiation, it is possible to use the Cockcroft -

Walton type, the Van de Graaf type, the resonant transformer type and the insulated core transformer type, or it is possible to use the different types of electron beam accelerator devices, like the linear type, the Dynamitron type, and the high frequency type, and it is possible to use sources that irradiate electrons that have an energy that is in the range of 100 ~ 1000 keV, and preferably, that is in the range of 100 ~ 300 keV. regarding the amount of the irradiation, usually, it is in the range of 0.5 ~ 30 Mrad.

[0023]

Moreover, as the radiation method of the ionization radiation beam, it is possible that first, an ultraviolet beam is irradiated and the ionization radiation curable resin material is cured and hardened to the degree that at least on the surface, it is dried to the touch, and after that by using an electron beam radiation, it is completely cured.

[0024]

The obtained according to this molding sheet s used as the die, and a glass paste, that is obtained as glass frit consisting of PbO, etc., a heat resistant pigment material, etc., are dispersed in an organic vehicle, is filled into the die, and the glass paste is transferred onto the glass substrate plate.

[0025]

Regarding the glass paste filling, as it is shown according to Figure 3, by using appropriate means, like the blade coating method using the blade 9, the glass paste 8 is supplied to the sheet indented part 23 of the molding sheet 2, and the inside part of the sheet indented part 23, is filled. Moreover, in the case when at the time when waviness is generated at the time of the blade squeezing, due to the periodic indentations and protrusions on the sheet indented part, it is a good option if the squeeze direction is made to be a direction that is tilted at an angle relative to the pattern of the cell barrier. Or it is also a good option if instead of a blade, a roll is used.

[0026]

After that, as it is shown according to Figure 3, while the vehicle solvent agent of the filled glass paste is not dried, the molding sheet 2 is wet adhered onto the glass substrate plate, as its sheet indented part side is contacted facing the surface side of the glass substrate plate 10, and the glass paste that has been filled into the sheet indented part, is wetted by the vehicle solvent, and then after that, when the molding sheet is separated, the glass paste is transferred onto the side of the glass substrate plate. Then, as it is shown according to Figure 4, from the molding sheet 2, the cell barrier 1 is obtained onto the glass substrate plate 10. Moreover, regarding

the inner surface of the sheet indented part, by the appropriate adjustment of the ionization radiation curable resin material etc., materials, it is wetted less than the surface of the glass substrate plate, by the glass paste, and because of that, at the time of the separation, the glass paste becomes transferred to the side of the surface of the glass substrate plate.

[0027]

So, by using one operation, on the surface of the glass substrate plate a glass paste is transferred so that the desired cell barrier shape is formed with the predetermined height, and if this is then annealed under the predetermined annealing conditions, it is possible to obtain the barrier cell with the target shape. Then, the back surface plate with the formed on it cell barrier And the front surface plate, are sealed and adhered, and by that the shown according to Figure 5, cell barrier structure possessing PDP, is obtained.

[0028]

Regarding the present invention, it is an invention that has as its primary characteristic the point that by the conducting of a one time patterning treatment onto the glass substrate plate, it is possible to form a cell barrier with a predetermined shape and with a predetermined height. And regarding the trapezoid shape of the cross section shape as it is shown according to Figure 4, the surface area of the front surface of the cell barrier part that is contacting the front surface plate, can be decreased, and because of that, there is the merit point that surface area of the image element is expanded and together with that, the PDP opening ratio is improved, and because of that an increased brightness (luminance) is obtained.

[0029]

As the shape of this cell barrier, according to Figure 4, it has a trapezoid shape in the state where the facing each other cell barriers that form the cells, are separated, however, the shape of other than that different types of cell barriers 1, and the shape of the molding sheets 2, that are necessary in order to obtain these shapes, are shown as examples according to the presented in Figure 6 ~ Figure 8. In the case of Figure 6, in the case when the facing each other cell barriers are separated from each other, they have a triangular shape, and in the case of Figure 7, they are separated they have a rectangular shape, and in the case of Figure 8, in the case when they are separated, they have a curved shape that becomes a protruded at the side of the front surface of the plate, for example, it is a semi-elliptic shape. Moreover, regarding the cross sectional surface of these cell barriers, it shows the shape of the longitudinal cross sectional surface of a cell barrier where for example, the cell region is formed as the cell is surrounded from the four directions, and because of that, the horizontal surface shape of the cell is not discussed.

[0030]

**[Effect]**

According to the manufacturing method of the present invention, by the ionization radiation curable resin material that is filled into the roll intaglio, the molding sheet that becomes the die for the glass paste, is obtained with a high precision. Then, in the sheet indented part of this molding sheet a glass paste is filled, and while it is in an undried state the molding sheet is contacted relative to the glass substrate plate, and then after that the molding sheet is separated, and when this is done, the glass paste is transferred onto the side of the glass substrate plate, because of the wetting difference

between the inner part of the sheet and the glass substrate plate. Regarding the shape of the transferred glass paste, it is shaped in correspondence with the shape of the indented part of the sheet and because of that, the shape of the indented part of the sheet is made to have the shape of the target cell barrier part, and by that, by a one time treatment relative to the glass substrate plate, the glass paste that has the target shape is formed on the top of the glass substrate plate. Then, it is annealed and by that, the target cell barrier can be obtained.

[0031]

**[Practical Examples]**

After that, the present invention will be especially explained in more details by using detailed practical implementation examples.

[0032]

**<<Practical Example 1>>**

**Manufacturing of the molding sheet**

As the film substrate material, polyethylene terephthalate film with a thickness of 25 microns (T-60, manufactured by Toray Company) was used, and then the shown according to the presented in Figure 3 molding sheet manufacturing equipment, and the below described intaglio roll, that has an intaglio part that has regular tetragonal pyramidal shape indented part spaces, was used, and an ionization radiation curable resin composition was used, and also, under the described here below conditions, on one side of that film substrate material, the female mold of the cell barrier part, with protrusions and indentations, that are opposite to those of the cell barrier, was provided. And by that the molding sheet was obtained.

[0033]

Roll intaglio

Cross sectional surface shape of the printing surface: the longitudinal cross sectional surface is a separated trapezoid.

[Figure 9 illustration]

The horizontal cross sectional surface shape has a stripe shape.

cell pitch P: 200 microns

cell groove width W: top floor - 180 microns, bottom floor - 150 microns

cell depth D: 150 microns

[0034]

Ionization radiation curable resin composition material

pentaerithritol triacrylate	90 weight parts
urethane acrylate oligomer	10 weight parts

[0035]

Radiation conditions

By using a curtain beam type electron beam radiation equipment, a 10 Mrad electron beam was irradiated.

[0036]

On the above described female mold part of the molding sheet, a glass paste, obtained as a low melting point glass frit, a heat resistant pigment material etc., were dispersed into an organic binder material, was filled by using a blade, and after that, the surface of the glass paste that has been filled into the female part of the molding sheet, was contacted relative to the front surface of the glass substrate plate used for the PDP, and then after that, the molding sheet was separated from the glass substrate plate, and the glass paste was transferred onto the glass substrate plate. After that, the glass substrate plate with the glass paste that has been transferred in a shape corresponding to the cell barrier shape, is annealed under conditions where the peak temperature is 585°C and the heating time was 15 minutes, and on the PDP glass substrate late the cell barrier was formed.

[0037]

## <<Practical Example 2>>

It is an example about the manufacturing of a molding sheet according to the Practical Example 1, where the roll intaglio, the ionization irradiation beam curable resin composition material, the radiation conditions were according to the described here below, and everything else was conducted the same way as described according to the Practical Example 1, and by that a cell barrier was formed on the surface of the glass substrate plate.

[0038]

Roll Intaglio:

Shape of the cross sectional surface of the printing surface: the longitudinal cross sectional surface is a separated trapezoid.

[Figure 10 reference]

The horizontal cross sectional surface shape has a square shape.

cell pitch P: 500 microns

cell groove width W: top floor - 450 microns, bottom floor - 100 microns

cell depth D: 150 microns

[0039]

Ionization radiation curable resin composition material

pentaerithritol triacrylate	90 weight parts
urethane acrylate oligomer	10 weight parts
2-hydroxy - 2- methyl - 1- phenyl propane - 1 on	
(manufactured by Merck Company, Durocure 1173)	0.7 weight parts

[0040]

Radiation conditions

High pressure mercury lamp, with ozone present, 160 W/cm x 2 lamps.

[0041]

[Results fr m the present invention]

As it has been described in detail here above, according to the manufacturing method for the preparation of cell barrier according to the present invention, a cell barrier with any type of shape can be manufactured with a good precision, by a one time patterning treatment, and by that it is possible to manufacture simply, quickly and also stably. And not only that, but also, it becomes possible that the cell barrier shape, can be other besides a rectangular parallelopiped shape, for example, a a trapezoid shape, etc., and the surface area of the surface of the cell barrier on the side of the front surface of the PDP, can be made small, and the high resolution of the PDP also becomes easy.

#### **[Detailed explanation of the figures]**

##### **[Figure 1]**

Figure 1 represents a summary diagram where (a) represents the filling technological process, and (b) shows the separation technological process.

##### **[Figure 2]**

Figure 2 represents a sectional view diagram showing one example of the relationship between the roll intaglio, the molding sheet and the shape of the obtained cell barrier.

##### **[Figure 3]**

Figure 3 is a conceptual diagram showing one example of the manufacturing equipment that is used in the technological process for the manufacturing of the molding sheet.

##### **[Figure 4]**

Figure 4 represents a cross sectional view diagram showing one example of the molding sheet and the corresponding cell barrier shape (the cross sectional surface is a separated trapezoid).

##### **[Figure 5]**

Figure 5 represents a conceptual diagram of the cross sectional view surface of a panel that is obtained as the back surface plate with the cell barrier and the front surface plate, are tightly adhered.

##### **[Figure 6]**

Figure 6 represents a cross sectional view diagram that shows another example of a

molding sheet corresponding to the shape of the cell barrier (the cross sectional surface is a separated triangular shape).

[Figure 7]

Figure 7 represents a cross sectional view diagram that shows another example of a molding sheet corresponding to the shape of the cell barrier (the cross sectional surface is a separated rectangular shape).

[Figure 8]

Figure 8 represents a cross sectional view diagram that shows another example of a molding sheet corresponding to the shape of the cell barrier (the cross sectional surface is a separated protruded curved line).

[Figure 9]

Figure 9 is a cross sectional view diagram and a tilted view diagram showing one example of the shape of the intaglio part of the roll intaglio.

[Figure 10]

Figure 10 is a cross sectional view diagram and a tilted view diagram showing another example of the shape of the intaglio part of the roll intaglio.

#### [Explanation of the symbols]

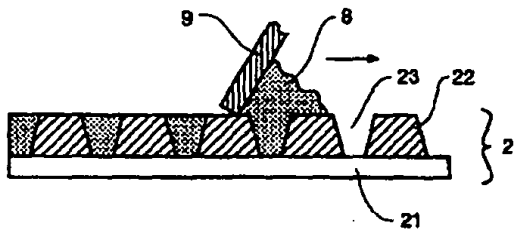
- 1.....cell barrier
- 2.....molding sheet
- 21.....film substrate material
- 22.....ionization radiation curable resin layer
- 23.....sheet indented part
- 3.....ionization radiation curable resin material
- 4.....roll intaglio
- 41.....intaglio part
- 51.....pressing pressure roll
- 52.....separation (stripping) roll
- 6.....coating equipment
- 7.....ionization radiation irradiation equipment
- 8.....glass paste
- 9.....blade
- 10.....glass substrate plate

**Patent Assignee: Dai Nippon Printing Company**

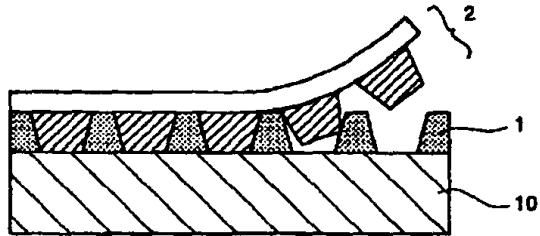


【図 1】

(a)



(b)



[Figure 1]

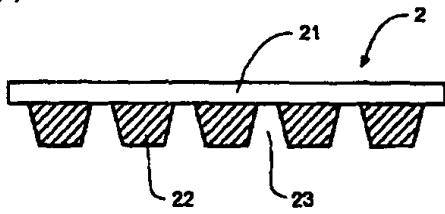
【图 2】

[Figure 2]

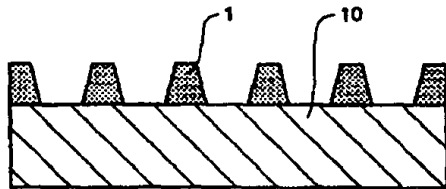
(a)



(b)

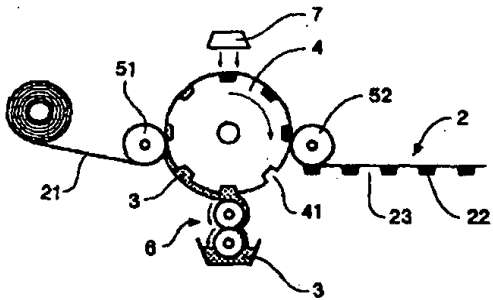


(c)



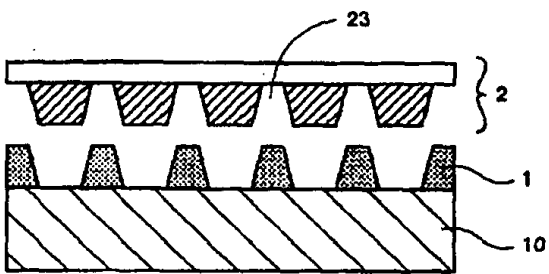
【图 3】

[Figure 3]

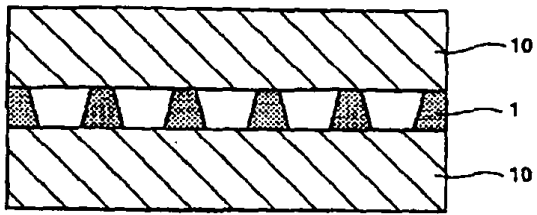


【图 4】

[Figure 4]

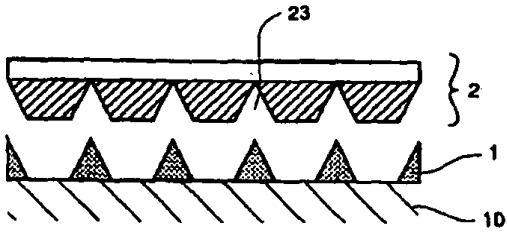


【図5】



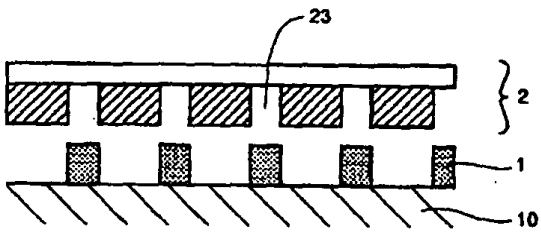
[Figure 5]

【図6】



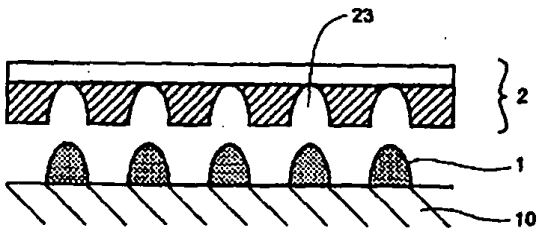
[Figure 6]

【図7】



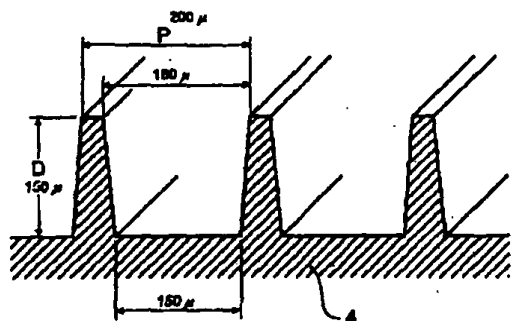
[Figure 7]

【図8】



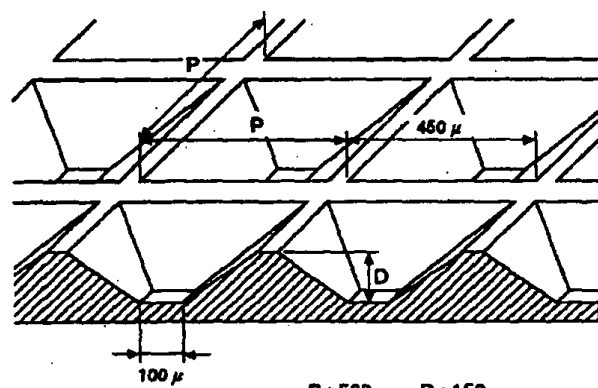
[Figure 8]

【図 9】



[Figure 9]

【図 10】



[Figure 10]

【図 10】

P :  $500\ \mu$  D :  $150\ \mu$

[Figure 10]